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## EFFECTS OF PHYSIOLOGIC HEAT STRESS ON COGNITIVE PERFORMANCE DURING SIMULATED FLIGHT TASKS

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**INTRODUCTION:** It is known that heat stress leads to reduced +Gz-tolerance in tactical aircrew. The first phase of an effort to determine the relationship between physiologic heat stress and flight performance was conducted using the new NAWCADPAX flight simulator installed in an environmental chamber. **METHODS:** 8 male volunteers ( $32.4 \pm 8.5$  yr,  $79.6 \pm 10.8$  kg) wearing full Combat Edge equipment, enhanced coverage anti-G suit, survival vest, and torso harness participated. The environmental conditions during an ALERT scenario were simulated including pre- and post flight brief, pre- and post flight aircraft inspection, alert, and 90 min flight. Ambient conditions were: brief: Tdb = 22°C, 45% RH; aircraft inspection and alert: Tdb = 44°C, Tbg = 49°C, 40% RH; flight: Tdb = 27°C, Tbg = 37°C, 40% RH. Data were collected during two separate days under these conditions and a single control day with chamber conditions at Tdb = 27°C, Tbg = 37°C, 40% RH. During inspections, subjects exercised on a bicycle ergometer at 40% of their VO<sub>2</sub>max. Rectal and skin temperatures (10 sites), heat flux (7 sites), and ECG were monitored. Subjects flew three different tail chase scenarios which were generated using a highly textured video graphical display and an F-18 aeromodel. Flight information was displayed on a HUD and subjects flew with a control stick and throttle. Scenarios included low (constant azimuth, varying altitude), medium (constant altitude high +Gz turns), and high workloads (varying altitude and turns). Flight performance was determined by comparison to the target aircraft. **RESULTS:** Performance scores declined after subjects were exposed to the hot alert conditions relative to control, though the difference was not statistically significant. Correlation analysis indicated a marginal relationship between the change in performance and rectal and mean skin temperatures ( $r=0.59$  and  $0.55$ , respectively). **CONCLUSIONS:** The experimental design did not account for the increased generation of metabolic heat associated with straining against high G forces, though it did include radiant heat loads. The next phase will include physical work in the cockpit to account for this additional factor.

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